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Holder of Patent:
Claas KGaA, 33428 Harsewinkel, DE

Inventor:
Werner Tertil, 33428 Marienfeld, DE;
Gerhart Clostermeyer, 33334 Gütersloh, DE
Dirk Esken, 33428 Harsewinkel, DE

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DE 93 16 685 U1

Baling press for harvested crops

A baling press for harvested crops with a receiving drum and a cutter rotor coupled behind shall be designed in a structurally simple manner so that a blockage can be removed without requiring time consuming manual handling.

In accordance with the invention, the cutter rotor 5 of the baling press is provided with a reverse rotary drive mechanism 15 that can be controlled by a control block 14. The reverse rotary drive mechanism 15 essentially consists of a ratchet wheel 21 mounted rotationally rigid on the shaft 7 of the cutter rotor 5, and a swiveling pivoted lever 22 to which is pivoted a catch that can be engaged with the ratchet wheel 21. The pivoted lever 22 is swiveled by a hydraulic cylinder 24.

Description

The invention refers to a baling press for harvested crops provided with a receiving drum and a cutter rotor coupled behind it that can be driven jointly in a rotating manner by a power take-off shaft of a tractor or by a self-propelled chassis by means of a drive mechanism provided with an overload coupling.

The baling press in question can be a swing ram baler, a carriage piston baling press or a round bale press, as disclosed, by way of example, in patent DE 295 04 531 U1. This text explains in detail a baling press with a receiving drum and a cutter rotor that is driven jointly in a rotating manner by the power take-off shaft of a tractor or by a self-propelled chassis by means of a drive mechanism provided with an overload coupling. When operating such a baling press it is unavoidable that the compressing unit becomes blocked because of the accumulation in the windrows of the harvested crop. Thus, in order to protect each of the driven components, the drive mechanism is provided with an overload coupling so that the driven components are immobilized in the case of a blockage. Patent DE 93 16 685 U1 discloses that in a round bale press the cutter rotor is provided with a spring loaded counter blade that is mounted on a shaft axially parallel to the rotary axle of the cutter rotor, and pivoted by means of an auxiliary drive into an operating or non-operating position. Also with such an assembly, in order to remove the blockage, it is required to actuate the reverse drive by manual operation and eventually remove the harvested crop by hand from the compressing unit. Such labor is not only complicated but also extremely time-consuming. In order for the harvested crop to be completely separated from the cutter rotor, the cutter rotor is provided with wipers that extend into the orbit of the cutters. The wipers are mounted on a shaft placed above the cutter rotor in such a manner that they are on the side facing the compression chamber. The stepped-shaped cutting disks of the cutter rotor are mounted in pairs on the shaft in such a manner that the distance between the

pair-forming cutting disks is less than the distance of the opposite cutting disks of two cutting disk pairs.

The object of the present invention is to design a baling press as initially described in a structurally simple manner so that a blockage can be loosened without any manual labor within the shortest period of time.

The task is solved in that at least the cutter rotor is connected to a reverse rotary drive that reverses its operating direction of rotation for the loosening of a blockage while the drive mechanism is immobilized, that the cutter rotor is provided with spring-loaded counter blades that are mounted on a shaft axially parallel to the rotary axle of the cutter rotor, and pivoted by means of an auxiliary drive into an operating or non-operating position, and that the auxiliary drive is controlled by a control block in such a manner that in the case of a blockage, prior to the activating of the reverse rotary drive, the counter blades swivel into the non-operating position.

Since the baling press is provided with a reverse rotary drive for the cutter rotor and an auxiliary drive for the shaft bearing the counter blades, in the case of a blockage it is possible to actuate the cutter rotor in a direction opposite to the operating direction of rotation. Thus, the harvested crop is extracted from the compression unit so that the blockage is loosened. Since the counter blades obstruct the path for the return conveyance of the harvested crop, the control is designed in such a manner that after the reverse rotary drive is activated, first of all is actuated the auxiliary drive so that the counter blades swivel into the non-operating position. With time delay is activated the reverse rotary drive. The driving elements for the cutter rotor in normal operation are provided on one side of the cutter rotor while the reverse rotary drive is placed on the other, the opposite side. In normal operation as well as in engaged reverse rotary drive, in

each instance, the drive of the cutter rotor is effectuated by free engine coupling. The control block for the reverse rotary drive and the auxiliary drive is advantageously mounted in the cabin of the tractor or in driver's cab of the self-propelled harvester, so that the operator does not have to get out of the cab in the case of a blockage.

Since for the loosening of the blockage the cutter rotor must be driven with a relatively high torque, other embodiments are designed in such a manner that the reverse rotary drive essentially consists of a ratchet wheel supported on the drive shaft of the cutter rotor and a rocking lever, movable in reverse, as well as a catch supported on the swiveling lever and engaging into the spacewidths. By means of the catch and the ratchet wheel is obtained a positive locking which ensures that also the cutter rotor is activated, since sliding or slipping can be excluded. Moreover, because the catch is mounted on the rocking lever that swivels in opposite directions, the length of the rocking lever can influence the torque. In a most simple manner, the rocking lever could also be manually actuated which, however, would render the baling press not as user friendly. Thus, it is provided that one end of the rocking lever is supported in a freely rotatable manner on the shaft of the cutter rotor and that a pivot drive, preferably the piston rod of a piston type cylinder unit, is connected to the rocking lever's opposite free extremity. The operation of the pivot drive is ensured because every tractor is provided with a hydraulic system. The pivot lever swivels with especially great force when the pivot drive is designed as a piston type cylinder unit.

In order to ensure that for the reverse rotation the catch engages in the ratchet wheel, it is provided that by means of a spring the catch can swivel into the engagement position and that, in the initial position obtained through the return movement of the rocking lever, the catch can swing into the non-

engagement position by means of a fixed limit stop. Thus it is prevented that the tip of the catch comes into contact with a tooth of the ratchet wheel. Structurally, this solution is particularly simple. The certainty of the function is however increased if, by means of a controllable swiveling device, the catch can pivot into the operating and non-operating positions. Such swiveling device consists of a toggle lever advantageously pivotally attached to the rocking lever and a tie rod forming the connection to the catch, that the extremity opposite to the rocking lever is connected to the pivot drive, being linked to the rocking lever by means of a drive type fastening. By such a mechanism it is attained in a very simple manner that the catch pivots into the non-operating position with the return movement of the rocking lever and that the catch is pivoted into the operating position for the reverse rotation of the cutter rotor, without the danger that the catch engages with a tooth of the ratchet wheel. The cutter rotor of baling presses is provided with wipers that are arranged in a row at the side facing the compression chamber, so that the harvested crop is separated at a determined point from the cutter rotor. So that such separation takes place also when loosening a blockage with the activated reverse rotary drive a second row of wipers is provided also on the opposite side of the compression chamber. Because the wipers are provided on the upper side opposite to the counter blades they are ineffective in normal operation.

Further advantageous embodiments of the baling press in accordance with the invention are object of further dependent claims.

The invention is explained in more details in connection with attached drawings, wherein:

Figure 1 shows in a lateral view a baling press designed as a round bale press;

Figure 2 shows in a diagrammatic view a baling press designed as a carriage piston baling press;
Figure 3 shows in a lateral view a first embodiment of the cutter rotor with the reverse rotary drive as a detail;
Figure 4 shows in a lateral view a second embodiment of the cutter rotor with the reverse rotary drive;
Figure 5 shows the embodiment according to Figure 4 in which the rocking lever is in its initial position and the catch in the non-operating position;
Figure 6 is a representation according to Figure 5 in which the catch engages in the ratchet wheel;
Figure 7 shows the cutter rotor with the counter blades and the wipers as a detail in a lateral view.

The round bale press 1 shown in Figure 1 is provided with a compression chamber 3 limited by compression rollers 2. The pick-up of the harvested crop is effectuated by a receiving drum 4 that, as shown in the illustration of Figure 1, is actuated clockwise. Between receiving drum 4 and the compression chamber 3 is provided a cutter rotor 5, whose operating direction during the compressing of the harvested crop is effectuated anticlockwise. The receiving drum 4 and the cutter rotor 5 are driven by a drive mechanism 6, shown only by way of indication in a not more detailed manner. Below the cutter rotor 5 are provided counter blades 8 supported on a common shaft 7 at equal distances to each other. The shaft 7 extends axially parallel to the shaft 9 of the cutter rotor. A lever 10 is rigidly mounted on at least one side of shaft 9. A pressure spring 11 acts upon this lever 10 causing the counter blades 8 to pivot into the operating position. Should the pressure on the counter blades become too high, they can avoid the effects of the pressure spring 11. Moreover, a piston rod 12 of a hydraulic cylinder 13 acts upon the lever 10. This hydraulic cylinder 13 can be controlled by a control block 14, which block is not explained in more details. The control

block 14 is usually installed in the cab of the tractor pulling the baling press. The individual valves of the control block 14 are not explained in more detail because they are known in the state-of-the-arts. From Figure 1 it can be gathered that by means of the hydraulic cylinder 13 the counter blades 8 can be pivoted into the non-operating position. Furthermore, the cutter rotor 5 is provided with a reverse rotary drive 15 not explained in more detail, which drive is positioned opposite to the main drive.

Figure 2 shows in a diagrammatic manner a carriage piston baling press 16. This carriage piston baling press 16 is provided with a curved intake duct 17 that is connected to the cutter rotor 5. The intake duct 17 ends in a compression duct 18 slightly curved toward the horizontal line, in which compression duct is a provided a movable compression slide 19. The conveyance of the harvested crop in the intake duct 17 is effectuated by a conveyance rake 20. The receiving drum 4 of the cutter rotor 5 as well as the auxiliary dive constituted by the hydraulic cylinder 13 and the reverse rotary drive 15 are structurally the same as in the round bale press shown in Figure 1.

Figure 3 shows a first embodiment of the reverse rotary drive 15 for the cutter rotor 5. In accordance therewith, the reverse rotary drive 15 consists of a ratchet wheel 21 mounted in a non-rotational manner on the shaft 7 of the cutter rotor 5, a rocking lever 22 mounted in a freely rotatable manner on the shaft 7, a catch 23 pivoted on a pin of the rocking lever 22, and a piston type cylinder in the form of a hydraulic cylinder 24, whose piston rod is linked by means of a yoke 25 to the free extremity of the rocking lever 22. The catch 23 is pivoted by means of a spring 26 into the tooth spaces of the ratchet wheel 21. The opposite extremity is shaped in an angular manner. Figure 3 shows in full lines the lowest position of the rocking lever 22, in which position the reverse rotary movement of the cutter rotor is discontinued for the time being. By the descending of the

hydraulic cylinder's 24 piston rod the rocking lever 22 pivots back into the initial position represented by a dot-dash line. Thus, the extremity of the catch 23 opposite of the ratchet wheel 21 strikes against a stationary limit stop 27, so that there is no longer contact with the teeth of the ratchet wheel 21. The angle of the catch 23 is shaped in such a manner that in this initial position, or normal position, the extremity of the catch 23 assigned to the ratchet wheel 21 is positioned between two teeth, so that this extremity comes immediately into contact with a tooth as soon as the piston rod of the hydraulic cylinder 24 is somewhat extended. The reverse rotation of the cutter rotor is effectuated in the direction of the arrow A until the blockage is sufficiently loosened. Therefore, the reverse rotating of the cutter rotor 5 is effectuated intermittently or at intervals.

In Figures 4 to 6 is illustrated a reverse rotary 15 drive in which the control of the catch 23 is effectuated by a swiveling mechanism 28 that is supported on the rocking lever 22. The swiveling mechanism 28 comprises a toggle lever 29 and a connecting rod 30 constituting the linkage to the catch 23. The connecting rod 30 is provided with a longitudinal compensation 31. The extremity of the toggle lever 29 opposite to the connecting rod 30 is provided with an elongated slot extending in the longitudinal direction of the corresponding side into which engages a bolt 32. The bolt 32 engages also into an elongated slot 33 that extends transversely to the longitudinal direction of the rocking lever 22. The bolt 32 is rigidly attached to yoke 25 of the hydraulic cylinder 24. Furthermore, a retaining spring 34 is secured to the rocking lever 22 that pulls the rocking lever 22 towards a stationary detent 35. Thus it is ensured that the extending, double-acting hydraulic piston moves with its terminal extremity the toggle lever 29 in the elongated slot before the rocking lever is entrained. Figure 4 illustrates according to Figure 3 the lower position of the rocking lever 22 in which the reverse rotary movement in direction of the arrow A of the cutter rotor is

finished. By reversing the hydraulic cylinder 24 by means of the control block 14, the rocking lever 22 is swiveled in the opposite direction of the arrow A into the final position illustrated in Figures 5 and 6. In Figure 5 is illustrated the initial position in which the catch 23 is not yet engaged with the ratchet wheel 21. At the same time, the bolt 32 is in the upper position of the elongated slot 33, that is to say, on the side facing the yoke 25. As soon as the piston rod of the hydraulic cylinder is slightly extended, the toggle lever 29 is swiveled into the direction of the arrow A. From Figure 1 it can be seen that the control block 14 also controls the hydraulic cylinder 24. The return rotary drive could also be designed as a step-by-step system. Figures 1 and 7 illustrate that the cutter rotor 5 is provided with two rows of wipers 36, 37, positioned in a structurally simple manner on a common shaft 38. This shaft 38 is upwardly offset opposite to the shaft 9 of the cutter rotor 6 being therefore positioned on the side opposite to the counter blades 8. Thus, the wipers encompass the cutter rotor 5 in its upper section. As illustrated in Figure 7, the wipers are shell-shaped. The free extremities project into the annular space described by the hubs 39 of the cutting disks 40 of the cutter rotor 5, thus preventing that a rest of the harvested crop is carried along.

Because of a simplified representation, the wipers of the carriage piston baling press illustrated in Figure 2 are not shown.

Also in a not shown manner, the cutting disks 40 of the cutter rotor 5 are mounted in pairs on the shaft 9. The distance between the pair-forming cutting disks 40 is less than the gap between two cutting disks 40, facing each other, of two pairs of cutting disks. To obtain the best possible cut, the counter blades 8 are placed in the center between two pair-forming cutting disks. The wipers 36, 37 are positioned in the center between two cutting disks, facing each other, of two pairs of cutting disks, so that the middle of each length of cut harvested crop comes into contact with the stationary wipers. The reference number list is:

1 round bale press
2 compression roller
3 compression chamber
4 receiving drum
5 cutter rotor
6 drive mechanism
7 shaft
8 counter blades
9 shaft
10 lever
11 pressure spring
12 piston rod
13 hydraulic cylinder
14 control block
15 reverse rotary drive
16 carriage piston baling press
17 intake duct
18 compression duct
19 compression slide
20 conveyance rake
21 ratchet wheel
22 rocking lever
23 catch
24 hydraulic cylinder
25 yoke
26 spring
27 limit stop
28 swiveling mechanism

29 toggle lever

30 connecting rod

31 longitudinal compensation

32 bolt

33 elongated slot

34 retaining spring

35 detent

36 wiper

37 wiper

38 shaft

39 hub

40 cutting disk

What is claimed is:

1. A baling press for harvested crops with a receiving drum and a cutter rotor coupled behind it that can be driven jointly in a rotating manner by a power take-off shaft of a tractor or by a self-propelled chassis by means of a drive mechanism provided with an overload coupling, **characterized in that** at least the cutter rotor (5) is connected to a reverse rotary drive (15) reversing its operating rotating direction for the loosening of a blockage with shut-down drive mechanism (6), that the cutter rotor (5) is provided with spring-loaded counter blades (8) that are mounted on a shaft (7) extending axially parallel to the axis of rotation of the cutter rotor (5) and pivoted by an auxiliary drive into an operating or non-operating position, and that the reverse rotary drive (15) and the auxiliary drive can be controlled by a control block (14) in such a manner that in the case of a blockage, prior to the setting into operation of the reverse rotary drive (15), the counter blades(8) can pivot into the non-operating position.

2. A baling press n accordance with claim 1, **characterized in that** the reverse rotary drive (15) essentially consists of a ratchet wheel (21) mounted on the primary shaft (9) of the cutter rotor and a rocking lever (22) operable in reverse motion, and a catch 23 supported on the rocking lever (22) engaging into the spacewidths of the ratchet wheel (21).

3. A baling press in accordance with claim 2, **characterized in that** the rocking lever (22) is pivoted with a free extremity on the shaft (9) of the cutter rotor (5) and that on the opposite free extremity of the rocking lever (22) is coupled a pivot drive, preferably the piston rod of a piston type cylinder unit (24).

4. A baling press in accordance with claim 3, **characterized in that** the rocking lever (22) can pivot into its initial position against a stationary detent (35) by means of a return spring (34).

5. A baling press in accordance with claim 2, **characterized in that,** by means of a spring (26), the catch (23) can pivot into the operating position and that it can pivot into the non-operating position from its initial position by means of a stationary limit stop (27).

6. A baling press in accordance with claim 2, **characterized in that** by means of a controllable swiveling mechanism (28) the catch (23) can pivot into the operating and non-operating positions.

7. A baling press in accordance with claim 6, **characterized in that** the swiveling mechanism (28) is constituted by a toggle lever (29) pivoted on the rocking lever (22) and a connecting rod (30) constituting the linkage to the catch (23), that the extremity of the toggle lever (29) opposite to the catch (23) is

connected to the pivot drive and that it is connected to the rocking lever (22) for entrainment.

8. A baling press in accordance with claim 7, **characterized in that** that connecting rod (30) is provided with a longitudinal compensation (31).

9. A baling press in accordance with claim 8, **characterized in that** the connection for entrainment consists of a bolt (32) projecting into an elongated slot of the toggle lever (29) and an elongated slot (33) extending transversely to the longitudinal axis provided in the rocking lever (22) in which slides the bolt (32).

10. A baling press in accordance with claim 9, **characterized in that** the bolt (32) is rigidly fastened to a yoke (35) of the pivot drive (24).

11. A baling press in accordance with one or several of foregoing claims 1 to 10, **characterized in that** the auxiliary drive for the counter blades (8) is constituted by a piston type cylinder unit in the form of a hydraulic cylinder (13).

12. A baling press in accordance with claim 1, in which the cutter rotor is provided with a row of wipers on the side facing the compression chamber, **characterized by the fact** that on the side opposite the compression chamber there is another row of wipers (37).

13. A baling press in accordance with claim 12, **characterized in that** the wipers (36, 37) of both rows are mounted on a common shaft (38).

14. A baling press in accordance with claim 12, **characterized in that** the wipers (36, 37) engage in the clearance formed by the cutting disks (40) facing each other of two pairs of cutting disks.

15. A baling press in accordance with claim 12, **characterized in that** the free extremities of the wipers (6, 37) project into the annular space defined by the hubs (39) of the cutting disks.

6 pages of drawings.

Translator's notes:

In column 5, line 16, the ratchet wheel 21 is referenced as #22.

In column 5, line 1, the German word is Rückhaltefeder (34) [retaining spring] while in lines 23 and 31 the same spring is referred to as Rückholfeder (34) [return spring].

In column 9, line 42, in claim 9, the rocking lever (22) is referred to as #33 (elongated slot).